CLAIMS

We claim:

1. A method of identifying a gene, expression of which is regulated by hydrodynamic stress, the method comprising

a) subjecting a first vascular endothelial cell of a mammal to hydrodynamic stress;

b) thereafter assessing the level of expression of the gene in the cell, and

c) comparing the level of expression of the gene in the first cell with the level of expression of the same gene in a second vascular endothelial cell of the mammal, the second cell being subjected to different hydrodynamic stress, whereby a difference between the level of expression of the gene in the first cell and the level of expression of the gene in the second cell is an indication that the gene is regulated by hydrodynamic stress.

2. The method of claim 1, wherein the cell is subjected to hydrodynamic stress using an in vitro flow chamber.

3. The method of claim 2, wherein the flow chamber is capable of generating a hydrodynamic stress flow field having spatially defined microheterogeneity.

4. The method of claim 3, wherein the microheterogeneity results in different hydrodynamic stresses exerted from one cell to another or from one part of a cell to another part of a cell in the flow chamber.

5. The method of claim 1, wherein the mammal is a human.

6. The method of claim 1, wherein the hydrodynamic stress is exerted in an amount from about 0 dyn/cm$^2$ to about 100 dyn/cm$^2$.

7. The method of claim 1, wherein the hydrodynamic stress is exerted for at least about several seconds.

8. The method of claim 1, wherein the cell is a single cell isolated in vivo.

9. The method of claim 8, wherein the cell is an arterial endothelial cell.

10. The method of claim 1, wherein the cell is a group of cells isolated in vivo.

11. The method of claim 1, wherein the cell is a single cell isolated in vitro from a confluent monolayer.

12. The method of claim 1, wherein the cell is one of a group of cells isolated in vitro from a confluent monolayer.

13. The method of claim 1, wherein the level of expression of the gene is assessed using amplified antisense RNA in combination with northern blotting or a microarray technique.

14. The method of claim 13, wherein the level of expression of the gene is assessed in a single endothelial cell.

15. The method of claim 13, wherein the level of expression of the gene is assessed in one of a group of endothelial cells.

16. The method of claim 13, wherein the level of expression of the gene is compared by transcriptional profiling following one of northern blotting and microarray analysis using one of a radiolabeled probe, a fluorescent probe, and a label.

17. The method of claim 13, wherein the levels of expression of a plurality of genes are compared.

18. A method of identifying a nucleic acid comprising a hydrodynamic stress regulation (HSR) region, the method comprising

a) subjecting a first vascular endothelial cell of a mammal to hydrodynamic stress;

b) thereafter assessing the level of expression of the nucleic acid in the cell, and

c) comparing the level of expression of the nucleic acid in the first cell with the level of expression of the same nucleic acid in a second vascular endothelial cell of the mammal, the second cell being subjected to different hydrodynamic stress, whereby a difference between the level of expression of the nucleic acid in the first cell and the level of expression of the nucleic acid in the second cell is an indication that the nucleic acid comprises a HSR region.

19. The method of claim 18, wherein the cell is subjected to hydrodynamic stress using an in vitro flow chamber capable of generating a hydrodynamic stress flow field having spatially defined microheterogeneity.

20. The method of claim 18, wherein the level of expression of the nucleic acid is assessed using amplified antisense RNA from a single endothelial cell.

21. A method of identifying a nucleic acid comprising an HSR region, the method comprising

a) comparing the sequence of a first nucleic acid with the sequence of a second nucleic acid comprising an HSR region, and

b) identifying a region of the first nucleic acid which is homologous to the HSR region of the second nucleic acid, whereby a nucleic acid comprising a HSR region is identified.

22. A method of identifying a hydrodynamic stress responsive protein, the method comprising

a) subjecting a first vascular endothelial cell of a mammal to hydrodynamic stress;

b) thereafter assessing the level of expression of a nucleic acid in the first cell, and

c) comparing the level of expression of the nucleic acid in the first cell with the level of expression of the same nucleic acid in a second vascular endothelial cell of the mammal, the

second cell being subjected to different hydrodynamic stress, whereby a difference between the level of expression of the nucleic acid in the first cell and the level of expression of the nucleic acid in the second cell is an indication that the nucleic acid encodes a hydrodynamic stress responsive protein, and

d) identifying a protein encoded by the nucleic acid, whereby a hydrodynamic stress responsive protein is identified.

23. The method of claim 22, wherein the cell is subjected to hydrodynamic stress using an in vitro flow chamber capable of generating a hydrodynamic stress flow field having spatially defined microheterogeneity.

24. The method of claim 22, wherein the level of expression of the nucleic acid is assessed in a single endothelial cell.

25. An array of nucleic acids comprising an HSR region, wherein at least one of the nucleic acids is selected by the method of claim 18.

26. A kit for carrying out the method of claim 1, the kit comprising

a) an instructional material,

b) a reagent for use in amplified antisense RNA;

c) a reagent for use in northern blotting or microarray analysis, and

d) a radiolabeled or fluorescent probe.